भारतीय मानक
Indian Standard

IS 16916 : 2018

पॉलीटेट्राफ्लुओरोएथिलीन (पीटीएफई) गैस्केट सामग्री

Polytetrafluoroethylene (PTFE) Gasket Materials

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Gasket and Packing Sectional Committee, MED 30

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Gasket and Packing Sectional Committee had been approved by the Mechanical Engineering Divisional Council.

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value observed or calculated, expressing the result of a test, or analysis shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

POLYTETRAFLUOROETHYLENE (PTFE) GASKET MATERIALS

1 SCOPE

This standard covers the general requirements and tests for "PTFE" sheets and strips (tapes) used as gasket materials for sheet cut gaskets and fabricated gaskets.

2 TERMINOLOGY

2.1 PTFE — PTFE is a non-asbestos sealing material either used for sheet cut non-metallic gaskets or used as soft filler material in the composite gaskets like spirally wound metallic gaskets, metal jacketed gaskets or used as soft sheathed materials for cam profile gaskets and metal corrugated gaskets and others.

PTFE based gasket materials will be suitable for more aggressive chemical applications including oxygen service and low temperature service.

Metal and materials inserted PTFE and flexible expanded PTFE are enabling the gaskets made from them to operate at higher pressures with structurally stable and without creep.

3 GENERAL (PTFE GASKET MATERIALS)

3.1 PTFE (Polytetrafluoroethylene**)** is the thermoplastic material. PTFE material used in gasket will be resistant to chemicals, caustics and acids. PTFE is the most commonly selected gasket material for the chemical applications. PTFE will have low surface energy and will not adhere to the contacting faces of the companion flanges.

3.2 Size and Forms of PTFE Gasket Materials

PTFE gasket materials will be available in the form sheets and strips (tapes). PTFE will be available in sheet form or in rolls. Generally the thickness of the sheet will be from 0.8 mm to 0.9 mm and strips thickness will be from 0.2 mm to 0.8 mm. The size of the sheet will be 1 500 mm × 1 500 mm and the width of the strip will be as per the buyer requirements.

3.3 Cut and Flat PTFE Gaskets

PTFE flat type gaskets are cut from sheets. They are suitable for sealing aggressive chemical mediums. PTFE sheet cut gaskets will work under low torque and also at low temperature service.

3.4 Sheet Cut Gaskets from PTFE and PTFE Filled Gaskets Applications

PTFE sheets and strips will be suitable as soft filler material for the composite type gasket. PTFE used gaskets are suitable for highly corrosive chemical media and high purity media.

PTFE will be impregnated with inserts (impregnated) like glass fibre, ceramic, SS and other alloy steels for high pressure applications

3.5 PTFE Gasket Materials Compatibility for Applications by Grade

a) Food grade material (used for medical and food production industries), and
b) Industrial grade (used for leak free joints with aggressive chemical mediums).

4 BASIC TYPES OF PTFE GASKET MATERIALS

There are three basic types of PTFE gasket materials:

a) Virgin PTFE;
b) Filled PTFE , and
c) Expanded PTFE.

4.1 Virgin PTFE Gasket Materials

Virgin PTFE is the commonly used PTFE material mostly for aggressive chemical applications as cut gaskets from the sheets or soft layer in the metallic gaskets.

4.2 Filled PTFE Gasket Materials

4.2.1 Filled PTFE is a gasket material with a virgin PTFE base to which a substance is added to improve the sealing characteristics of PTFE.

4.2.2 Generally "filler" inserts will be glass or graphite particles.

4.2.3 For a few applications and service conditions ceramics will be used as filler material. The resulting gasket material will be strong and stable. The gasket produced using this PTFE material will be compressible and chemical resistant according to the metal or non-metal filler used with this virgin PTFE material.

4.3 Expanded PTFE

Expanded PTFE is produced from the virgin PTFE. This is produced by expanding the virgin PTFE into a highly brill structure. The stress resistance will be added by means of molecular rearrangement during manufacturing process. This process ensures that the molecular chains from which the PTFE is constructed, do not arrange themselves into set patterns. The expanded PTFE will possess no structural weakness (grain) and expands and contracts equally in all directions. The expanded material will be easier to compress and shall exhibit resistance to creep and cold. No additives will be used for expanded PTFE. It shall continue to possess the chemical resistance of virgin PTFE.

Expanded PTFE strips (tapes) will be used as filler material along with the metal strip winding for the fabrication of spirally wound metallic gaskets fitted in the flange joints fitted in highly corrosive and chemically aggressive mediums handled applications.

5 TYPICAL PROPERTIES OF PTFE MATERIALS (SHEETS AND EXPANDED STRIPS/TAPES)

See Table 1.

6 FLEXIBLE AND EXPANDED PTFE GASKET STRIP (TAPE) USED AS FILLER MATERIAL FOR SPIRALLY WOUND GASKET.

Expanded PTFE material produced from 100 percent virgin PTFE is available as continuous strip in rolls.

It will be available in the width and thickness specified by the buyer.

Expanded PTFE material which is softer and more flexible, is called flexible expanded PTFE. It has following properties:

a) The expanded PTFE strip material will be compressible, flexible and shall exhibit excellent resistance to creep and cold;

b) Expanded PTFE material soft filler will be squeezed and pushed out during compression load applied by the flange pairs on both the faces of spirally wound gasket due to bolting up pressure freely flows and forms a soft bedding for the full seating and effective sealing of the flange joint;

c) Expanded PTFE material will easily conform to the contacting flange faces and fills in to the irregular, rough and cavities in the contacting surfaces;

d) Spirally wound metallic Gaskets with PTFE as soft filler requires less bolt torque;

e) Expanded PTFE material will not contaminate or discolour due to the exposed media;

f) PTFE does not age over time and will not be affected by ultraviolet;

g) PTFE will not swell due to water absorption;

h) PTFE material has a longer shelf life;

j) PTFE material has no smell or taste, and

k) PTFE is neither contaminating nor toxic.

7 CALCULATIONS VALUES FOR PTFE MATERIAL USED FOR GASKETS

Sl No. (1)	*PTFE Thickness* (2)	*Yield Stress (MPa)* (3)	*Gasket Factor* (4)
i)	3.2 mm	8.3	2.00
ii)	2.5 mm	9.3	2.50
iii)	1.6 mm	11	2.75
iv)	0.8 mm	22.1	3.50

8 MARKING

8.1 BIS Certification Marking

Each product may also be marked with the Standard Mark.

8.1.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act,* 2016 and the Rules and Regulations made thereunder. The details of the conditions under which the licence for use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Table 1 Properties of PTFE Materials

Sl No. (1)	**Property** (2)	**Units** (3)	**Virgin with Filled Sheets** (4)	**Virgin without Filled Sheets** (5)	**Expanded Tapes** (6)
i)	Specific gravity	g/cc	2.15 - 2.24	2.13 - 2.20	2.13 - 2.20
ii)	Hardness	Shore D	55 - 58	52 - 65	N/A
iii)	Dielectric strength	volts/mil	N/A	500 – 1 000	500 – 1 000
iv)	Temperature Range	°C	Minimum 200°C to maximum 232°C	-200°C to + 232°C	-200°C to + 232°C
v)	Operating Pressure limit	MPa	Full vacuum to 20 MPa	Full vacuum to 20 MPa	Full vacuum to 20 MPa
vi)	Compressibility	—	68 percent	68 percent	68 percent
vii)	Recovery	—	12 percent	12 percent	12 percent

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Gasket and Packing Sectional Committee, MED 30

Organization	*Representative (s)*
Indian Institute of Technology, Kharagpur	Prof (Dr) S. Ram (***Chairman***)
Banco Products (India) Ltd, Baroda	Shri V. K. Gupta Shri S. Selvalumar (*Alternate*)
Bharat Corrub Industries, Vadodara	Shri B. M. Tolia Shri S. R. Desai (*Alternate*)
Bharat Heavy Electricals Ltd, Trichurapalli	Shri Subrata Ray Shri R. Elayaraja (*Alternate*)
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Engineers India Ltd, New Delhi	Shri P. Bhattacharjee Shri Nalin Kumar (*Alternate*)
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RITES Ltd, Gurgaon	Shri S. S. Gavane Shri D. K. Bisht (*Alternate*)

Organization	*Representative (s)*
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The Tata Power Company Ltd, Mumbai	Shri Dhiraj B. Kamath Shri V. V. Namjoshi (*Alternate*)
Uni Klinger Limited, Pune	Shri Mahe Avachat
BIS Directorate General	Shri A. R. Rengarajan, Scientist 'E' and Head (MED) [Representing Director General (*Ex-officio*)]

Member Secretary

Miss Khushbu Jyotsna Kindo
Scientist 'B' (MED), BIS

Bureau of Indian Standards

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